



GAU 2881

Atty. Docket No. 002935 USA/PDC/ICT/DB
PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

8/12/01
Response
O. Carty

In re Application of

Dieter WINKLER et al.

Application No.: 09/162,103

Group Art Unit: 2881

Confirmation No.: UNKNOWN

Examiner: B. Anderson

Filed: September 28, 1998

For: CHARGED PARTICLE BEAM MICROSCOPE WITH MINICOLUMN (as amended)

RESPONSE UNDER 37 C.F.R. § 1.111

BOX NON-FEE AMENDMENT

Assistant Commissioner for Patents
Washington, DC 20231

Sir:

Responsive to the Office Action dated January 12, 2001, within the shortened statutory period for response, Applicants submit the following remarks:

Claims 1-26 are all the claims pending in the subject application. Claims 1, 4 and 7-11 are rejected under 35 U.S.C. § 102(b) as being anticipated by Sturrock et al., USP 5,786,601 ("Sturrock"). Claims 2-3, 5-6 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Sturrock, in view of Schamber, et al., USP 5,376,792 ("Schamber"). Claims 12-26 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Sturrock. Applicants respectfully traverse these rejections, and request reconsideration and allowance in view of the following arguments.

Claim Rejections – 35 U.S.C. § 102

Claims 1, 4, and 7-11 are rejected under 35 U.S.C. § 102(b) as being anticipated by Sturrock. Sturrock is directed towards an electron beam lithography machine and in particular to the mounting

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components and displacement monitoring system. The machine described by Sturrock comprises an inspection chamber and an electron beam column mounted thereto, and has a monitoring and positioning system to overcome beam deflection caused by vacuum and thermal expansion. The column is mounted on a relatively massive (col. 4, lines 12-18) unitary steel plate 12 (Fig. 2) which is connected to and is an integral part of the vacuum vessel defined by a lid 19 and a casing 20 (Fig. 2). The electron beam column 11 is in communication with the inspection chamber such that both the column and chamber are evacuated by the same vacuum source. *→ Claims does not require separate vacuum source
see pg 3, 22-23*

Regarding claim 1 of the present application, clearly Sturrock describes an electron beam column of a conventional type and not a minicolumn. "The machine incorporates an electron beam optical column 11, of which only the lower end portion is shown in Fig. 1." See col. 4, lines 2-4. Further, Sturrock fails to disclose any mini-environment into which an electron beam source may be placed. To the contrary, Sturrock shows the electron beam column connected to and opened to the inspection chamber. Both are evacuated by the same vacuum pump. Still further, Sturrock is directed at maintaining a fixed spatial relationship between the electron beam column and the inspection stage, to compensate for any relative movement due to deflection and thermal expansion. "It is therefore the principal object of the invention ... to achieve greater stability of the positional relationship of the components to each other and to the beam." See Sturrock, col. 2, lines 15-19.

Sturrock teaches no more than Fink, Kruit, or Bubeck, on which the Examiner relied previously, as far as a minicolumn or a mini-environment is concerned. Sturrock is silent as to *Claim language is also silent*
dimensions per se. Moreover, the location of the disclosed column relative to other structure points toward a column of conventional size, rather than toward a minicolumn.

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The present invention as claimed in claim 1 is directed towards an electron microscope having a minicolumn that is housed in a mini-environment. The minicolumn is small enough that it is practical to have its own mini-environment, either separate from or in communication with the environment of the inspection chamber (the claim does not specify which). *With this admission, applicant acknowledges the admit*

On the other hand, Sturrock uses a conventional electron beam column that is in communication with the inspection chamber but because of its size, the column is not in an environment separate from the inspection chamber. Such an electron beam column is large and in fixed relation to the inspection chamber. Sturrock's purpose is to maintain a fixed relationship between the column and inspection chamber, and to further compensate for movement caused by vacuum deformation and thermal expansion. *In this case, size does matter.* Sturrock's electron beam column is of such a size that the column itself causes the inspection chamber deformation. Its weight aggravates the deformation caused by the vacuum. Its size contributes to thermal gradients and results in thermal expansion. *An advantage of the present invention is that the size of a minicolumn enables it to be placed in a separate chamber thus avoiding the necessity of compensation for deformation and thermal expansion.* A further advantage is that the minicolumn may be placed in its own separate chamber so that the inspection chamber vacuum may be retained when the minicolumn is repaired or replaced thereby reducing maintenance time. *]*

Sturrock does not reasonably suggest or teach that an electron beam column may in its own environment separate from the main inspection chamber. Instead, Sturrock teaches an electron beam column in a fixed arrangement with the inspection chamber. Thus, Sturrock teaches away from the

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present invention's recitation of an electron beam source in a mini-environment. Therefore, Applicants submit that Sturrock does not anticipate or render obvious claim 1 of the present application.

Regarding claim 4, claim 4 depends from claim 1 and Applicants submit that this claim is allowable for at least the reasons presented above.

Claim 7 recites an electron microscope having a minicolumn within the main inspection chamber. Sturrock, as shown in Fig. 1, clearly has only a portion of the electron beam column in the inspection chamber. Because Sturrock uses a conventional electron beam column as a source, the entire column cannot be placed within the inspection chamber. Sturrock teaches away from placing the electron beam source within a separate chamber in the main inspection chamber. ^{thus is not claimed} Therefore, Applicants submit that Sturrock does not anticipate or render obvious claim 7 of the present application.

Claims 8-11 depend from independent claim 7, and therefore are allowable for at least the arguments presented above.

Claim Rejections – 35 U.S.C. § 103

Claims 2-3 and 5-6 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Sturrock, in view of Schamber. Schamber is directed to a scanning electron microscope having a compact, replaceable electron beam emitter assembly and concentric liner tubes. The electron beam emitter assembly is designed to use inexpensive elements and may be disposed of after a single use (col. 4, lines 22-25). Schamber also describes concentric liner tubes, the outer tube being part of the vacuum containment system, and the inner liner tube being within the vacuum and having supports for spray baffles and beam shaping orifices. Because the inner liner tube is not part of the vacuum containment

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system, it may be inexpensively fabricated of light gauge tubing and may be considered disposable (col. 8, lines 27-35). However, replacement of either the electron beam emitter assembly or the inner liner tube will require the release of the vacuum.

Regarding claims 2-3, neither Sturrock nor Schamber describe a minicolumn or any means to insert a minicolumn into or extract a minicolumn from an inspection chamber. Even if Sturrock and Schamber were combined, the combination still would not teach a means to insert a mini-column into an inspection chamber containing a vacuum. Because all the claim limitations are not taught or suggested by Sturrock and Schamber, Applicants submit that the Examiner has failed to make out a *prima facie* case for obviousness.

Still further, no motivation exists to combine Sturrock and Schamber. Even though both Sturrock and Schamber are directed towards certain aspects of electron microscopy, each is directed towards a completely different aspect. Sturrock is directed towards a means to ensure alignment of the electron beam with a specimen, whereas Schamber is directed towards inexpensive replaceable parts of the electron beam column. Because no motivation exists, the *prima facie* case for obviousness has not been met. The fact the prior art references can be combined does not render the combination obvious unless there is some desirability to combine.¹ Here there is no desirability to combine Sturrock and Schamber.

Regarding claims 5-6, neither Sturrock nor Schamber, taken alone or in combination, teach or suggest a separate chamber within the main inspection chamber, and therefore a mini-environment as

¹ *In re Mills*, 916 F.2d 680, 16 USPQ2d 1430 (Fed. Cir. 1990).

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claimed in claim 5 (and hence in claim 6 which depends from claim 5) would not have been obvious over Sturrock in view of Schamber. Because the combination does not teach all the limitations of the present invention, the *prima facie* case for obviousness has not been met.

For at least the above reasons, and for the reason that claims 2-3 and 5-6 depend from independent claim 1, Applicants submit that these claims are patentable.

Claims 12, 13, and 15-17 have been rejected as being unpatentable over Sturrock because the *arguendo* allegedly functional recitation "holding" has not been given patentable weight. Assuming *arguendo* that the Examiner is correct, Sturrock still does not teach a mini-column. Sturrock shows a cantilever arm 22 connected to a column, but as has been explained in detail previously, Sturrock's column is not a minicolumn. Therefore, Applicants submit that claim 12 is patentable. Claims 13 and 15-17 depend from independent claim 12 and Applicants submit that these claims now stand in condition for allowance.

Regarding the recitation of a "turnable stage", Applicants respectfully disagree with the Examiner that a turnable stage and an x-y stage are equivalent. An x-y stage allows the specimen to be moved in an x direction, a y direction, or a combination of both an x and a y direction, while a turnable stage rotates the specimen through 360 degrees about its vertical axis.

For at least two reasons, a turnable stage is not the equivalent of an x-y stage. First, if an electron beam source is fixed, as in a conventional electron beam microscope, the means to effect the x-y movement must be sufficient to allow the entire specimen to transit beneath the electron beam. X-y stages require space at least twice the size of the specimen to position any point on the specimen beneath the electron beam. A rotatable stage, on the other hand, requires only the area of the specimen

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when a minicolumn is mounted on a pivotable arm. As is well known, larger inspection chambers adversely affect the reliability and cleanliness of the equipment, and a smaller inspection chamber is preferred. Clearly an x-y stage requires more area than a rotatable stage, and for this reason, an x-y stage is not the equivalent of a rotatable stage.

Second, to completely scan a specimen using an x-y stage, the specimen must make numerous passes in each the x and y directions in an iterative manner and each pass requires time to iterate for a subsequent pass. Using a rotational stage and a minicolumn on a pivotable arm, the specimen may be inspected in a continuous movement thereby eliminating the need to iterate for a subsequent pass. Using a rotatable stage rather than an x-y stage can clearly reduce the time need for a complete specimen scan. Applicants submit that for at least these reasons, an x-y stage is not the equivalent of a rotational stage, and respectfully disagree with the Examiner's assertion. Accordingly, Applicants submit that claims 12 and 24 are patentable for this additional reason as well.

Regarding claims 18-26, the Examiner asserts that it would have been obvious to a skilled artisan to incorporate more than one minicolumn in an electron microscope. Applicants assert that given the use of conventional electron beam columns in Sturrock, the skilled artisan could not have used multiple columns, and certainly would not have been led to use multiple minicolumns, for all the reasons provided above. Sturrock describes a mounting arrangement to achieve greater stability of the relationship between the axis of an electron beam column and the inspection chamber (col. 2, lines 16-20) and this mounting arrangement does not accommodate multiple columns. Still further, Sturrock fails to teach or suggest a plurality of minicolumns. For at least this reason, claims 18-26 are allowable.

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Pursuant to the foregoing discussion, Applicants submit that claims 1-26 in the subject application are patentable.

The Examiner's rejections having been overcome, Applicants submit that the subject application is in condition for allowance. The Examiner is respectfully requested to contact the undersigned at the telephone number listed below to discuss other changes deemed necessary. Applicants hereby petition for any extension of time which may be required to maintain the pendency of this case, and any required fee for such extension is to be charged to Deposit Account No. 19-4880.

Respectfully submitted,



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I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to:

Assistant Commissioner for Patents
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Date: April 12, 2001

Signed: Thea K. Wagner
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